DOCUMENT RESUME

ED 054 762	24	HE 002 594
AUTHOR	Watt, John R.	
TITLE	Interdisciplinary Curriculum Development in Hospital Methods Improvement. Final Report.	
INSTITUTION	Texas Univ., Austin.	
SPONS AGENCY	Office of Education (DHEW), Washington, D.C. Bureau of Research.	
BUREAU NO	BR-9-G-082	
PUB DATE	31 Mar 71	
GRANT	OEG-7-70-0149(509)	
NOTE	50p.	
EDRS PRICE	MF-$0.65 HC-$3.29	
DESCRIPTORS	*Curriculum Development; *Health Occupations Education; *Higher Education; Hospitals; *Instructional Materials; *Interdisciplinary Approach	
IDENTIFIERS	Improvement Techniques; Industrial Engineering Methods	

ABSTRACT

The major purpose of this project was to develop a "package" curriculum of Hospital Methods Improvement techniques for college students in health related majors. The elementary Industrial Engineering methods for simplifying work and saving labor were applied to the hospital environment and its complex of problems. The report's introduction presents a list of course materials. Chapter I discusses the background and objectives of the project, including the program at the University of Texas and its advantages and disadvantages. The project history is presented in chapter II by summarizing earlier project reports. Chapter III deals with the procedures for and problems of developing the different materials for the course. Chapter IV presents the contents of the package curriculum that include: an orientation book, semi-notes, and case problems. Chapter V presents letters and opinions evaluating the project; and Chapter VI discusses the need for this course, the lack of books and teachers for such a program; the need for work analysts; and markets for this course. (AF)

PA 24
BR 9-G-082
HE

ED054762

FINAL REPORT
Project No. 9-G-082
Grant No. OEG-7-70-0149-(509)

INTERDISCIPLINARY CURRICULUM DEVELOPMENT IN HOSPITAL METHODS IMPROVEMENT

John R. Watt
University of Texas at Austin
Austin, Texas 78712

March 31, 1971

U. S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

HE002594

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

ED054762

FINAL REPORT
Project No. 9-G-082
Grant No. OEG-7-70-0149-(509)

INTERDISCIPLINARY CURRICULUM DEVELOPMENT IN HOSPITAL METHODS IMPROVEMENT

John R. Watt
University of Texas at Austin
Austin, Texas 78712

March 31, 1971

U. S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

FINAL REPORT

Project No. 9-G-082
Grant No. OEG-7-70-0149-(509)

PROJECT ACTIVITIES AND RESULTS

(Progress from Sept. 15, 1969 to Mar. 31, 1971)

John R. Watt
The University of Texas at Austin
Austin, Texas

March 31, 1971

The research reported herein was performed pursuant to a grant with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions states do not, therefore, necessarily represent official Office of Education position or policy.

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

CONTENTS

		Page
	Summary	1
	List of Course Materials	2
I.	Background and Objectives	3
	Industrial Engineering	3
	University of Texas Program	5
	Advantages of	6
	Disadvantages of	7
	"Package Curriculum" Idea	8
II.	Project History	8
	Sept. 15 - Dec. 1, 1969	9
	Dec. 1 - Mar. 1, 1970	9
	Mar. 1 - Aug. 1, 1970	9
	Aug. 1 - Nov. 3, 1970	10
	Orientation Book	11
	Questionnaire	11
	Personnel Problems	13
	Clerical Work	14
	Nov. 3 - Jan 20, 1971	14
	Jan. 21 - Mar. 31, 1971	15
	Final Events	16
III.	Operating Methods	17
	Orientation Book	17
	Semi-Notes	17
	Case Problems	18
	Rewriting	18
	Lantern Slides	18
IV.	Project Results	19
	Orientation Book	19
	Copyright Problems	20
	Illustration Problems	20
	Semi-Notes	21
	Semi-Notes Method	21
	Proposed New Semi-Notes	23
	The Present Semi-Notes	23
	Architectural	23
	Introductory	23
	Large-Scale Techniques	24
	Small-Scale Techniques	24
	Personal-Relations Strategy	24
	Check Lists	24
	Case Problems	25
	Introductory Essay	25
	Editors of *Fortune* Book	25

Hospital Layout 26
Nursing Floor Design 26
Dietary Department 26, 27
Emergency Room 26
Central Supply 26
Pharmacy 26
Paperwork 26
Accountability 26
Machine Operation 26
Coordinating People 27
Nursing Unit 27
Room Layout 27

V. Project Evaluation 28
Orientation Book 28
Users letters 28
Editors letters 33
Semi-Notes 34
Statistical Evaluation 34
Fall 1969 Results 35
Fall 1970 Results 36
Special Category Results 37
Comparison With Other Faculty 37
Informal Student Opinions 38
Case Problems 39

VI. Conclusions and Recommendations 40
Need for this Course 40
Lack of Books and Teachers 41
Need for Work Analysts 41
Markets for this Course 42

VII. Appendix 44
Questionnaire Results Sheet 45

OE Bureau of Research No. 9-G-082 Grant No. OEG-7-70-149(509)

Period:

Date of Submission:

Name of Institution: The University of Texas at Austin

Title of Project: Interdisciplinary Curriculum Development in Hospital Methods Improvement

Name of Project Director: Dr. John R. Watt

Office of Education Dallas Office

FINAL REPORT

Summary. This project had the major purpose of writing a "package" curriculum of Hospital Methods Improvement techniques for health-related college students, including majors in:

Architecture	Pharmacy
Dietetics	Physical Therapy
Engineering	Pre-Medics
Management	Psychology
Medical Technology	Social Work
Nursing	Sociology

Essentially, this curriculum will apply the elementary Industrial Engineering methods for simplifying work and saving labor to the hospital environment and complex of problems. It will include materials already taught six times in the author's University of Texas classes in this new field, plus new materials gathered especially for it.

A second purpose of this project is to test the new curriculum and material upon local students and thus perfect them for other professors to use. In this new field, almost all instructors begin with very inadequate backgrounds. The new curriculum is designed to help fill this deficiency.

The term of this curriculum-development project began September 15, 1969, and was to run a year. By letter of June 12, 1970 from Dr. H. A. Haswell, the term was extended to December 15, 1970.

Because his most valuable assistant, an experienced Registered Nurse, did not return in September, the author petitioned for an additional time extension through May 31, 1971. This was refused, in essence, by Mr. Maynard E. Weidmann, Contracts Officer, in November 1970.

The author was generally instructed to complete the project as soon as possible. This he has done, necessarily foregoing several intended and valuable features.

Accordingly this project has developed a "teaching kit" or "package course" to encourage new teachers to teach this material. This is designed to help instructors totally unfamiliar with this new field to teach it competently from the start.

Specifically this "package course" consists of:

(1) A 187-page duplicated book for orienting students to the hospital environment and to hospital organization and function, department by department. This is entitled Introduction to a Typical U.S. General Hospital: Key Offices, Departments, Functions, and Paperwork.

(2) A set of 14 special classroom syllabi tentatively called "semi-notes". These replace normal classroom lecturing and give the students nearly perfect sets of notes without prior instructor knowledge or preventing classroom discussion.

(3) A set of 11 special case-type homework problems. These contain much instructive material and are supplied with all the work-sheets, forms, etc. needed for solution.

(4) A set of semi-notes with special inset data for instructor's use. These help maintain students' attention and initiate discussion, while giving the new instructor quick command of the subject.

This kit was intended for use with the only related commercial textbook, A. C. Bennett's Methods Improvement in Hospitals, Lippincott, 1964. However, this book left the market in 1970, and the semi-notes and problems have been rewritten to compensate.

One commercial booklet is used in this course: Our Ailing Medical System: It's Time to Operate, by the Editors of Fortune, Perennial Library, Harper and Row, 1970, 95¢.

It is hoped that schools of Nursing, Dietetics, Pharmacy, Medicine, Physical Therapy, Medical Technology, Hospital Administration, Public Health, etc., will adopt this course.

I. BACKGROUND AND OBJECTIVES

Hospitals, clinics, nursing homes, mental institutions, and other medical facilities are in near crisis today because of growing administrative, personnel, and technological problems. With the expansion of public-funded medical-care programs and our growing population, they receive great new responsibilities without equivalent increase in operating efficiency or labor supply.

Studies of the 7,130 U.S. hospitals reveal that few staff members have labor-saving training. Almost all their work systems conceal untold waste-motion, lost time, and duplicated effort. Meanwhile, the ultra-fractionated nature of the industry blocks the spread of efficient methods and preserves the old: needless paperwork is hand-written, hand copied, hand-delivered, then hand-filed or destroyed; incredible distances are walked on essential and non-essential tasks; poor scheduling keeps hospital technicians idle while patients wait for already ordered drugs, X-rays, or laboratory tests.

Such wastes of labor, plus severe recruiting difficulties, ensure that (a) health institutions today always lack nurses, technicians, and other personnel, and (b) hospital-care costs grow 16-17% yearly and averaged $80.00 per day in 1970.

Unfortunately, few hospitals and institutions (almost none in Texas) have Industrial Engineering staff or consultants. Not only are "hospital industrial engineers" very scarce, but few hospital administrators know that non-engineers can apply much of the methodology to simplify and streamline institutional work-patterns and departments.

Thus, two related goals demand attention: (a) demonstrating the efficacy of lay-persons using these skills in health facilities, and (b) developing means for teaching them to non-engineering health professionals.

The Material to be Taught. Industrial Engineering, once called "Scientific Management," is an area where Engineering and Management overlap. It seeks to optimize the productivity of human and other systems in industry and business. Together with mechanization, it created our highly efficient mass-production industries.

Industrial Engineering has highly mathematical techniques like Operations Research, Dynamic Programming, and Queueing Theory which only experts can use. However, many others require neither mathematics nor great mechanical aptitude, so are applicable by non-engineers. These include:

Flow Process Charts	Forms Design
Flow Diagrams	Operation Charts
Procedure Flow Charts	Right and Left Hand Charts
Work Distribution Charts	Principles of Motion Economy
Activity Charts	Work-Place Layout
Man and Machine Charts	Time Study

These general techniques constitute traditional Motion and Time Study, now called Methods Engineering. They operate by leading their users into such careful step-by-step recording of human tasks that improved methods occur to them either spontaneously or via minor study aided by published checklists or tables of recommendations. Accordingly, any diligent college-graduate has capacity to apply them.

Using these techniques almost always simplifies work and saves labor, times, effort, or distances travelled. Frequently, equipment, materials, utilities, floorspace, accidents, and mistakes are also saved.

Unfortunately, despite relatively easy use by trained non-engineers, Methods Engineering remains a monopoly of Engineering colleges. For historical reasons, aside from some Business Administration schools, no one else teaches it. This helps explain its unfamiliarity in areas which most need it: public education, local government, and the hospital-health field.

Thus, virtually no curriculums in Hospital Administration, Nursing, Medicine, Pharmacy, Dietetics, Medical Technology, or Social Work teach this material, far less the Sociologists and Psychologists who train institution officers.

Accordingly, almost no hospitals, clinics, nursing homes, and health institutions, etc., regularly use these techniques. Only about 200 of the 7,130 U.S. hospitals have staff industrial engineers, and scarcely more have regular industrial engineering consultants.

An infinite number of appropriate Methods Engineering problems thus await solution in health facilities. Not only are manual

tasks abundant, but the high turnover of personnel has prevented the natural improvement of methods which might have been expected.

As in Industry, both lower-level and upper-level work problems must be solved. Step-by-step analysis with Methods Engineering methods will attack 90% of total work problems, primarily the lower-level ones involving the highest savings. Fortunately, it does so at relatively low cost: Each professional methods engineer in hospitals is estimated to save three times his salary yearly.

In contrast, the now fashionable installation of computers, conveyors, teletypes, and closed-circuit television cannot affect over, perhaps, 10% of present labor wastage, and does so at significant cost.

Since the hospital-health field abounds in urgent lower-level problems, much of professional industrial engineers' training may be wasted. Until these are under control, he is seldom free to apply his mathematical techniques on upper-level problems. Accordingly, the use of well-trained semi-professional Work Analysts to specialize on lower-level work seems the most economical solution today.

Because of their lower pay compared to professionals, each one in full-time methods-improvement work should save five-times his salary yearly, while freeing engineering-trained professionals to attack harder problems.

Unfortunately, no one today is systematically training such semi-professional Work Analysts. The Texas Program is perhaps the first.

The University of Texas (at Austin) Program: To explore these problems, the University of Texas' Department of Mechanical Engineering, which teaches Industrial Engineering, instituted a pilot Hospital Systems and Research Program in 1967. Instruction began in February 1968. Selected senior and graduate students were taught a course in Hospital Methods Improvement which included practicum experience in applying their knowledge in local public and private hospitals.

Students were selected from the following departments: Engineering, Management, Nursing, Dietetics, Pharmacy, Pre-Med, Sociology, Medical Technology, Psychology, and Social Work, because of the

probability of their later following hospital or institutional careers. This project was funded by The University through June, 1968. The author initiated it with the aid of a part-time student assistant and (for three months) an administrative assistant.

He gathered data, taught the three-hour course in health-oriented methods-analysis and work-simplification, wrote a seventy-page text to orient students to hospital surroundings, and directed the five-weeks practicum experience of about four hours per week per student. The cooperating institutions included Austin's Municipal Brackenridge Hospital, Seton and Holy Cross voluntary hospitals, and two mental institutions: Austin State Hospital and Austin State School.

In the field work, student teams made studies of "bottleneck" and other inefficient operations suggested by hospital officials, and attempted to simplify or solve them in detailed reports forwarded to the administrators. Despite difficulties in supervising this phase (the weakest aspect of the initial course), several students made impressive analyses and suggestions adopted by the cooperating hospitals.

Unfortunately, supervisory difficulties forced the abandonment of this field work in recent semesters.

Believed Unique Advantages of this Program: U.S. colleges, led by Michigan and Georgia Tech, now graduate together perhaps twenty "hospital industrial engineers" yearly. Industry's great demand for engineers keeps this output low, frustrating the many hospitals and hospital associations who would hire such professionals.

The Texas program suggests that non-engineering-trained "hospital-health Work Analysts" can solve many institutional problems nearly as well as the scarce professionals. Accordingly, it aims to teach one or two work-simplification courses with ample field-practice to all qualified students in health-related fields.

The probable advantages of this policy seem as follows:

1. Many more Work Analysts can be produced. Most students with health-career interests seem capable of becoming successful practitioners. With time, The University of Texas alone should produce twice as many Work Analysts as the current national output of true hospital industrial engineers.

2. More female Work Analysts can be produced. Women Work Analysts may have advantages where complex problems involve women employees.

3. More "psychologically aware" Work Analysts can be produced. Psychology, Sociology, and Management graduates should have advantages in personnel-relations problems.

4. More hospitals and institutions can afford semi-professional Work Analysts than professional ones. With degrees in Nursing, Dietetics, Pharmacy, Management, Social Work, Pre-Medics, Sociology, or Psychology, etc., the proposed Work Analysts offer employers two areas of skill, and should serve small and medium-sized enterprises better than pure professionals.

5. The Texas-type training can be applied more rapidly after graduation. Because of their para-medical degrees, the proposed Work Analysts should grasp institutional problems with less orientation delay. They should apply work-simplification to their own work almost immediately.

6. Semi-professional Work Analysts should make admirable assistants to engineering-trained professionals. Having sophisticated aides to make routine studies and solve lesser problems should free professionals for larger issues. This might double their overall efficiency.

7. This style of training helps recruit college graduates into health fields. Engineering and Management students who took the Texas course became interested and several entered hospital careers.

The above advantages seem probable, not proven. A more fully developed curriculum, including a second course, and more experience in directing the practicum field work should help prove them.

Disadvantages of this System:

Only minor disadvantages have been experienced:

1. The available textbooks seem written either for engineering students or for experienced hospital employees.

2. Background materials and case problems are widely scattered and slow to obtain.

3. Much liaison work is needed. Close relations are needed with the cooperating field-work hospitals, their department heads, the local Hospital Association, and the heads of several University departments.

4. Supervising the student practicum field work is relatively difficult, and a satisfactory system must be evolved.

The "Package Curriculum" Idea. To encourage hundreds of schools and colleges to teach "hospital-health Work Analysts", the Dallas branch of the Office of Education, a division of the U.S. Department of Health, Education, and Welfare, has sponsored the author in developing an ideal curriculum which non-engineers could easily teach.

Specifically, the author's teachings would be consolidated into a "kit" or "package" which any health-professional could teach to interdisciplinary or other classes. The resulting curriculum would necessarily be "self-contained", so as to minimize the instructors' need for prior experience in the field.

This project has produced such a transferrable curriculum, tailored to the non-engineers and others who must teach it.

II. PROJECT HISTORY

This project was divided into six distinct periods. Three of these were covered by scheduled Progress Reports accepted by the Office of Education supervisors.

A fourth was reported in two lengthy but informal letters similarly accepted. It is reported upon somewhat more fully here.

The fifth period is reported upon informally by letter, but is really covered for the first time below. The final period is from January 20, 1971 to the present, the date of this final report.

Summary of Project's First Reporting Period (Sept. 15 - Dec. 1, 1969). For this project's first 10 weeks, the author worked alone, unable to find an assistant. His department furnished adequate clerical assistance, and he was able to develop most of one semester's programmed teaching materials called "semi-notes" and use them in two Fall classes totaling 51 students. Of course, most other project duties were necessarily postponed.

A Registered Nurse with 20 years hospital experience was hired December 1, 1969, to serve part-time as the author's assistant.

The December 1 Progress Report included a copy of the typical "semi-notes" classroom syllabus.

Summary of Project's Second Reporting Period (Dec. 1 - Mar. 1, 1970). The newly hired assistant proved unsuitable and was released shortly. Another Registered Nurse, Mrs. Betty Strohm, a former employee of known quality, was hired January 26 in her place, to work half-time. To help make up for over 4 months without assistance, a Pre-Medics senior and former student named Albert Capanna was hired as a second half-time assistant on February 12. Between the two, making up the lost time seemed possible at that time.

The author's department continued to supply needed typing, and further classroom materials were developed and used before the Fall semester ended on January 15. Several of the initial ones were rewritten, based on their classroom performance.

The author spent Feb. 2 through 6 in New Orleans attending the joint meeting of the Hospital Management Systems Society (a division of the American Hospital Association) and the Hospital Division of the American Institute of Industrial Engineers.

On February 2, a new class of 16 students began the author's Spring class in Hospital Methods Improvement. The prepared teaching materials, both new and revised, began further usage.

Summary of Project's Third Reporting Period (Mar. 1 - Aug. 1, 1970). The experimental "semi-notes" teaching method was continued with the Spring class of 16 students, the third such full-semester trial. This was a particularly satisfactory class, but the students' comments suggested that the semi-notes worked better in the latter half of the course than in the first, or background, part.

Accordingly, the first two semi-notes, on the history of and the types of hospitals, were abandoned and their material incorporated into the orientation book noted below. A third semi-notes unit, on the current U.S. health-care and hospital costs crisis, was abandoned in favor of a Time magazine article which the author reproduced for his students.

The author gave a paper entitled "Applying Basic Industrial Engineering in the Hospital Labor Crisis" at the Gulf-Southwest Section Meeting of the American Society for Engineering Education, April 2-4, 1970, at New Mexico State University, Las Cruces.

The project's two part-time assistants, Registered Nurse Betty Strohm and Pre-Medics senior Albert Capanna, served until late May, when both left. They had been particularly gathering and selecting visual aids to accompany the other teaching materials.

Mrs. Strohm left to supervise her children during their summer vacation, and anticipated returning in September. A partial replacement, Pre-Medics senior Joseph Alcorn, was hired in July.

The author principally worked to improve (1) the semi-notes for the second half of the course, and (2) the text for orienting students to hospitals. He took June off as a vacation, then spent July and August on this project, aided by the new Pre-Medics senior.

The principal work was converting the author's 1968 70-page pamphlet and other materials into a short illustrated book for orienting interdisciplinary students to hospital organization, operation, and problems, department by department. This had been used successfully in several prior classes.

Summary of Project's Fourth Reporting Period (Aug. 1 - Nov. 3, 1970). The two letters written on November 3, 1970 were not intended as a formal report, but developed into one. The first letter enclosed a copy of the Orientation Textbook developed by the project and a completed set of 16 semi-notes used in at least two classes.

The second letter requested the last noted extension of time, when the author reported that he could neither complete the project on time nor hire adequate assistants to aid him.

The above reports were accepted by Dr. Haswell, Director of Educational Research at the Office of Education in Dallas, but the related request was denied.

Three principal factors were discussed in these letters:

The Orientation Book. The author's 1968-69 pamphlet for familiarizing the students with hospital organization and function was 60% rewritten and new chapters and illustrations added, bringing the total length to 187 consecutively numbered pages plus several unnumbered additions. Planned to form the first third of the proposed curriculum, this retained its original 1968 name, Introduction to a Typical U.S. General Hospital.

Letters were sent to various publishers asking permission to use their illustrations in the book, most of which had been informally copied from advertisements and hospital-magazine cartoons, etc. (Such copying for purely educational, non-profit classroom use is conventional in colleges today.)

With the further addition of perhaps five chapters, the expansion of another, and the addition of possible 25 photographs, the author believes that this will become a highly publishable book, probably the only one of its type on the market.

Accordingly, six copies of this book were sent to key persons in the Hospital Industrial Engineering field, asking for criticism and suggestions. Their replies were expected to constitute evaluations of this third of the curriculum being developed.

Because at least 70 pages of this book existed before this project began, the author queried Dr. Harold A. Haswell, Director of Educational Research at the Dallas branch of the Office of Education about possible copyrights. He replied, suggesting whom to contact in Washington. This has not been done to date.

The Questionnaire. The author completed the writing of 18 different semi-notes syllabi for classroom use. The subject matter covered the general field of work-simplifying techniques which he believed were pertinent to general hospitals. Here, he followed principally the lead of the textbook used in his related University teaching, A. C. Bennett's Methods Improvement in Hospitals. Mr. Bennett is the 1970 president of the Hospital Management Systems Society.

In August, a previously approved questionnaire was mailed to 90 members of the Hospital Management Systems Society, chosen because of direct employment by hospitals or consulting firms in the field. Only two teachers were included.

The aim was to find what coverage the real professionals (not the educators), believed should be in the proposed curriculum. The coverage of the author's Spring 1970 course, which used the project-developed orientation book and semi-notes plus the Bennett book, was described statistically; then the questionnaire recipients were asked to suggest what subject matter should be either increased or decreased in emphasis, based upon their experience. They were also asked to suggest possible new materials for inclusion.

The results proved clearly that this questionnaire should have been mailed out far earlier. However, the writing of the classroom materials had demanded first priority; they had to be completed before they could be tested in the author's actual classes.

Further, the author didn't suspect that his choice of materials (and Mr. Bennett's) differed so much from that of the practicing, non-academic professionals in the field. Thus, the questionnaire had been intended to glean minor, last-minute corrections and improvements, not to determine major shifts of emphasis.

The 52 questionnaire respondents were highly unanimous in their suggestions. Specifically, they recommended that several items should be greatly reduced in coverage, whereas other items not covered in either the semi-notes or Bennett should be added. The author accepted the validity of these suggestions and began to follow them.

The author agreed less with the related suggestion that less emphasis be given to orienting the students to the hospital world. (He believes that the respondents somehow assumed greater prior student knowledge of hospitals than really exists.)

Significance. The author fully intended to incorporate the chief questionnaire results into the project curriculum, including abandoning several already tested semi-notes. Because Bennett generally covered their basic material, abandoning these constituted reduction of coverage rather than elimination.

Specifically, the already completed and tested semi-notes on Assembly Process Charts, Multiple Activity Analysis, Multi-Man Analysis, and Right and Left Hand Analysis would be dropped, and replacements written on Time Study, Fatigue, Computers, and Management Principles (none of which Bennett covers) and probably others on Work Sampling and Room and Building Layout (both covered in Bennett).

Parts of two of these new semi-notes were written, but subsequent events prevented their completion.

In recognition of the questionnaire respondents' suggestion to reduce orientation emphasis, the author decided to abandon the use of orientation slide-pictures in the classroom, adding the pictures instead to the Orientation Book.

Project Personnel Problems. As noted earlier, Mrs. Strohm, the author's most valuable part-time assistant, resigned in late May to tend her children during their public-school summer vacation, and did not return in September as anticipated.

With the project formally ending in December 1970, it seemed fruitless to seek another retired Registered Nurse to replace her. If found, such an assistant would have scarcely learned the work by the then termination date. Instead, an extension of time was requested, largely to make such a recruiting effort worthwhile, but was refused by the project sponsors.

The necessity of having a hospital-trained assistant, preferably a Registered Nurse, cannot be exaggerated. The author is not hospital-trained yet had to write hundreds of pages about hospital problems and their solution, without glaring errors, even in mere terminology. No mere secretary or graduate student would have sufficed.

Accordingly, while Mr. Alcorn ably replaced Mr. Capanna when the latter entered Medical School, the loss of Mrs. Strohm was an unexaggerated calamity. Mrs. Strohm was herself a published writer, and losing her criticisms and suggestions were a second blow which only an author writing in a complex and unfamiliar field can appreciate.

This project thus received an unexpected handicap during this period, which has continued to this day. In particular, the several projected new semi-notes were not written, and the securing of pictures and written permission to publish them was nearly abandoned and fell far behind schedule.

Clerical Work. As in prior periods, the author's Department furnished excellent typing, duplicating, and even bookbinding service.

Not only were students furnished copies of the Orientation Book for trial use, but also reprinted magazine articles and approximately 122 pages each of semi-notes and case-type problems. Thus, during this semester, at least 430 pages of duplicated material was furnished the students gratis for classroom evaluation.

Much extra typing occurred also, as most semi-notes were modified after each use, to improve classroom response and student retention. Much rewriting occurred also to increase the instructor's speed in class, thus allowing more time for spontaneous student discussion.

Summary of Project's Fifth Reporting Period (Nov. 3 - Jan. 20, 1971). This period included intense work as the author began writing two new semi-notes, and prepared to begin others, in accordance with the questionnaire results noted earlier. His student assistant busily wrote letters asking the right to publish particular illustrations.

The format of the project's finished curriculum was well fixed. The Orientation Book, the semi-notes and the case-type problems were all designed to supplement Bennett's formal textbook noted earlier. The semi-notes and the problems both depended on Bennett's illustrations to complement their explanations.

Then came two disappointments.

First, we were notified that Bennett was out-of-print and would not be republished. This was totally unexpected; despite some deficiencies, it was the only book of its type available.

The author rewrote and added illustrations to several semi-notes and problems to eliminate dependency upon the book. Further, several semi-notes discarded in view of the questionnaire results above were reinserted into the curriculum in lieu of Bennett's coverage.

This reworking of previously completed materials, caused first by the questionnaire and then by the loss of the Bennett book, necessarily delayed project completion, but should have improved the quality of the results if time had been available.

At this point, the previously requested extension of completion date was denied, which obviated several planned activities. Specifically, abandoned were the proposed new semi-notes, the preparing of visual aids beyond those already incorporated in the materials, and the writing of new chapters for the Orientation Book.

In November and December, the author taught a special one-month short-course on National Health Problems to advanced Management students. Prior to this, in agreement with the Office of Education contract, for the initial 14 months of the project he had taught only two classes per semester.

The Mechanical Engineering Department, which had furnished without compensation immense amounts of typing, duplicating, collating, stapling, punching, and related services, plus large quantities of paper, levied its charges. These essentially exhausted the funds allocated for Salaries and Wages and for Other Expenses.

On December 31, the formal project term expired, and the original contract with the Office of Education fell into default. Joe Alcorn resigned, and the author hired Mr. Tom Eschenbrenner, a Master's degree candidate in Business who has great interest and knowledge of hospital affairs in his place. The author began paying him from personal funds.

Summary of Projects' Final Reporting Period (Jan. 21 - March 31, 1971). This projects' final period involved three varieties of writing activity.

First, the rewriting of Semi-notes III, XIII, and XIV was completed, to eliminate repetitive and unimportant material, and to remove dependence on the Bennett book.

The Questionaire response by hospital industrial engineers in the field had dropped the latter two semi-notes from the presumably final set, but the loss of Bennett's book reinstated them to insure coverage of Multiple Activity and Multi-Man analyses.

Second, the author prepared the special sets of semi-notes for instructors' use. These have the "fill-in" material already inserted in distinctive Gothic type, together with occasional other data in the right-hand page margins.

The author intended to provide more of the latter discussion data than was finally possible. At some future date he hopes to remedy this.

Third, he completed the final writing of the Case Problems, making the last few independent of the former textbook.

Finally, he wrote almost all the present Final Report during this period.

Meanwhile he taught his seventh consecutive interdisciplinary college course in Hospital Methods Improvement. At the project end, eleven of the fourteen semi-notes had been used in this class, all in their most perfected form.

This completed the Project's writing work. In all, about 362 single-spaced pages of original writing had been researched and executed, divided approximately as follows:

Orientation Book (new additions)	117 pages
Semi-Notes	117 pages
Case Problems	128 pages

In addition, approximately 30 more pages had been written but not used. Possibly another 60 pages was entirely rewritten because of the unexpected changes caused by the Questionaire and the unanticipated loss of Bennett's textbook.

The total output of perhaps 452 carefully composed single-spaced pages was not intentionally a solo effort. At the outset, it seemed possible to recruit adequate assistants to share the load. However, the demand for hospital-trained personnel proved so great that in the elapsed 18 months, a qualified assistant was available only about 4 months half time.

No number of part-time students could fill such a gap. Hence the 12-months task required 18 months to complete.

The author is grateful for two extensions of time granted him. The first was from the original termination date, September 31, 1970, to December 31, 1970.

The second, from about March 16 to March 31, 1971, assisted in the final completion. However, the latter was not the extension requested earlier, and it did not permit the several planned improvements discussed earlier.

At final writing the author was both paying his student assistant personally, and privately purchasing ring binders for the materials being delivered to the Office of Education with this Final Report.

III. OPERATING METHODS

This project had formal operating methods approximately as follows:

(1) The Orientation Book

- (a) Research all possible details of hospital organization and operation
- (b) Write them into suitably titled chapters
- (c) Submit to Mrs. Strohm for suggestions
- (d) Rewrite for student use
- (e) Submit to others for suggestions, and rewrite as needed
- (f) Select possible illustrations
- (g) Write for other illustrations
- (h) Write for rights to publish illustrations

(2) The Semi-Notes

- (a) Research all possible details of various Industrial Engineering techniques applicable to hospitals
- (b) Write them into suitably titled semi-notes
- (c) Draw sketches to illustrate, as needed
- (d) Use in one or more classes and note "hesitation points" and questions aroused
- (e) Rewrite to eliminate defects and improve communication powers
- (f) Ask students for suggestions
- (g) Use in a subsequent class, and rewrite as needed

(3) The Case Problems

(a) Research hospital problems which invite the use of particular work-simplification techniques
(b) Write them into suitably titled problems
(c) Draw suitable illustrations and charts
(d) Add suitable background material
(e) Submit to Mrs. Strohm and others for criticism and suggestions
(f) Rewrite as needed
(g) Use in one or more classes
(h) Grade students' Case Problems as submitted
(i) Rewrite as suggested by students' results

The above several processes gave all the course components repeated classroom testing but required great amounts of duplicating service. Two semesters, at least 300 pages of Orientation Book, semi-notes, and Case Problems were distributed to each student. Last Fall, this reached a peak of 430 pages given to each. This present semester, the Orientation Books were merely loaned to students, but 245 pages of semi-notes and Case Problems were distributed.

The testing of these materials in four successive semesters and the frequent rewriting explain why clerical and related costs consumed inordinate portions of the budget. Specifically, the related clerical costs consumed the Salaries and Wages funds left unused by the lack of a principal assistant during most of the project term.

Minor project activities included developing lantern slides for orienting students to hospital life and functions. These were used in two classes but consumed inordinate time, so their conversion into Orientation Book illustrations was planned.

Much project activity involved evaluation of the work. The repeated classroom use in itself constituted evaluation and re-evaluation of the teaching materisls.

Other evaluation, specifically of the whole program and its portioning of subject-matter, was conducted by the Questionaire noted earlier. Approved by Office of Education officials in Washington, this obtained the opinions of 52 actual hospital industrial engineers concerning the author's then course content, and caused abandonment of some materials and the rewriting of others.

IV. PROJECT RESULTS

This project has produced a tested "package curriculum" with which non-engineering-trained instructors can teach interdisciplinary classes to make Work Simplification studies in health institutions.

Although falling short of the author's desires, it should more than serve its purpose. The author himself has used virtually all of it in four separate interdisciplinary Hospital Methods Improvement classes, and some parts in six classes.

This package curriculum consists of:

1. The Orientation Book

   The author has converted his 70-page pamphlet, Introduction to a Typical U. S. General Hospital: Key Offices, Departments, Functions, and Paperwork, written in 1968 and early 1969, into a 187 page book explaining hospital structure and function, department by department.

   Because no other book of this type seemingly exists today, this one should be highly publishable when a few more chapters and illustrations are added, and copyright protection is granted the publisher.

   Aside from use with this package course, this book should have several markets. First, large numbers of Nursing Schools, especially those attached to colleges and junior colleges should be interested. These schools, far more than the earlier hospital-based three-year diploma nursing schools, need means to orient their students to hospital life and functions.

   Second, a smaller number of schools of Hospital Administration and of Public Health seem potential buyers. A few Medical Schools and Architecture Schools may use them. Third, many hospitals may use them for orienting new employees, department heads, trustees, and volunteer workers. Finally, the current drive for some sort of "National Health Care Plan" will presently bring thousands of new people into health-care

management who will need rapid orientation.

These possible markets being speculative rather than guaranteed, commercial publication may well depend upon offering publishers significant copyright protection. Similarily, it may be necessary to add an experienced Hospital Administrator as co-author to insure acceptance by the hospital world.

Copyright Problems. The book being incomplete, the author has not applied for a copyright, though he has marked each copy as though copyrighted. This bluff seems justifiable since approximately 100 copies of various versions have been given to students since 1968, and perhaps 12-15 to nurses, physicians, hospital administrators, and industrial engineers, etc., in return for their suggestions. Such circulation has been advantageous, but obviously risks losing the book to others.

Hereafter, fewer copies will be circulated, and today's students are loaned, not given, copies.

All writing is by the author, and no external quotations are used. The ownership of a possible future copyright may be nevertheless confused because the author wrote much of the book before this project, much of it under this project, and (presumably) will finish it after this project. The author thus probably must divide the copyright ownership with the Office of Education. Application to clarify this matter awaits future time.

Illustrations Problems. At the moment of writing, several illustrations now in this book cannot be further reproduced because legal rights to copy them were not obtained. In the case of two cartoons, the artists asked for cash payments beyond their value here. Other owners queried simply did not answer.

Conversely, a number of illustrations not now in the book have been granted reproduction rights. These are chiefly photographs and were not used due to the lack of time.

At some future date, the latter illustrations can be substituted for the former ones. Thus, a full complement of legally reproducible illustrations is available. No copies of the book have been sold, and all use has been for educational purposes,

hence the author believes that the past reproduction of several pictures without permission has been legal. However, at the moment, until substitutions are made, reproducing these books further might be inadvisable. Sale would invite various liabilities, of course.

Future Plans. The author hopes that he can complete this book during the next year, adding extra chapters, illustrations, etc., as needed. He will clarify the copyright situation with the Office of Education beforehand. Finally, he will solicit publishers. Of course, the immediate use for this book remains as before: it is part of the package course developed by this project.

2. The Semi-Notes

The second part of the completed package course is a system of 14 classroom syllabi or semi-notes which make beginning instructors' work both easier and more effective.

These cover the how-to-do it phases of the course, the actual application of labor-saving and work-simplifying techniques.

The Semi-Notes Method. Basically, these semi-notes consist of explanatory prose, organized textbook style and duplicated single space on standard 8½ x 11 sheets. The text provides full coverage of the subject matter, beyond the capacity of either lecturer or note-takers to follow by conventional methods.

Where needed, illustrations are either provided in the extra wide right-hand margins or interleaved on separate pages.

However, perhaps 20% of written data is omitted. Where some of the most important sentences, lists, or examples should be, there are merely spaces provided for their manual addition by the students. Almost every paragraph thus needs the students' aid in completing it.

Accordingly, these key items receive extra visual, oral, and manual attention, increasing their long-term retention. Meanwhile, each manual insertion creates a minor reward or "reinforcement" effect.

The classroom discussion and the instructor provide the data to fill the gaps in each syllabus. The students have ample time to write these in and still participate in discussion, ask questions, and examine exhibits passed around the room, projected, or otherwise displayed.

The semi-notes are printed with specific horizontal spaces for each missing item. Meanwhile the broad right-hand margin of each page is available for the students' informal notes, sketches, etc.

In general, allowing for discussion, questions, etc., a class can fill about 200 words of such fill-in material per 50-minute class period. About 800 words of lesser text are simultaneously covered, as the students gain perfect sets of notes without strain or writers' cramp.

This system allows for great flexibility. While the basic text remains the same, the instructor can vary the data to be delivered in class. For example, the author used the same semi-notes one semester for both his Hospital Methods Improvement class and his related Industrial Engineering class, by merely changing the examples and cases cited. In practice, this feature should make such courses both easy to keep up to date and adaptable to various local situations.

The many students which have used this system have repeatedly stated that it makes the notes more thorough and accurate, and allows more time for listening and remembering.

The author hopes eventually to also "key" these notes with a textbook. Certain of the spaces provided for missing data will be identified with an asterisk. This will direct the students to the textbook for the fill-in data, and the instructor will pointedly omit giving it in the classroom. Such integration of text and lecture notes seems advantageous.

Attempts to key these semi-notes to the Bennett book were lost when the latter left the market.

The semi-notes method doesn't provide Self-Paced Instruction, Computor-Assisted Instruction, Programmed-Book Instruction, or other forms of "self-teaching". It merely but greatly improves the conventional lecture method, especially where the instructor is unfamiliar with the course material and adequate textbooks do not exist. In essence, the semi-notes form a textbook which the instructor and the student help

to write. As such, retention of key materials should be very great.

As noted, this field now lacks an appropriate textbook of any sort. The semi-notes (with all spaces filled in and illustrations added) could be converted easily into either a programmed or a conventional text on Systematic Work Simplification in Hospitals.

The author has no plans other than to add new semi-notes to the present group. As noted earlier, for best coverage, the following semi-notes should be added:

(1) Systematic Room and Building Layout
(2) Time Study
(3) Work Sampling
(4) Fatigue
(5) The Principles of Management
(6) The Principles of Motion Economy
(7) Operation or Operator Process Chart Analysis

Of these, the first two are partly written and the last is complete, having been used in two classes. Its use was abandoned when the Questionaire results showed its low applicability to real hospital problems. Such expansion of the semi-notes list is impossible in normal college one semester, three-hour courses. The above additions assume a two-semester (or at least a two-quarter) sequence, not yet available. Meanwhile, the semi-notes principle seems worth developing as a teaching mode in other fields.

The Present Semi-Notes. Of the present set of semi-notes, the first two cover two architecturally-related hospital problems which include great labor-saving opportunities:

(1) The Obsolete Hospital Buildings Problem
(2) Labor Saving Redesign in Sickrooms and Elsewhere

The third semi-notes surveys the standard Industrial Engineering work-simplifying techniques applicable to hospitals; and the fourth, the agencies providing these services to hospitals today:

(3) Introduction to Work Simplification

(4) Work Simplification -- Who Should Do it
-- Where to Begin

The remaining ten semi-notes explain how to apply the seven standard techniques believed of greatest importance to average hospitals. They are organized as follows:

Large-Scale Techniques. These study whole work systems involving multiple jobs and people. Thus, they promise the maximum savings for minimum effort. They are numbered:

(5) Flow Process Charts and Flow Diagrams
(5a) Assembly or Operation Process Charts
(6) Process Chart Analysis
(7) Check List for Process Chart Analysis
(8) Final Flow Process Chart/Flow Diagram Strategy
(9) Work Distribution Analysis
(10) Check List for Work Distribution Study
(11) Revising the Work Distribution Chart
(12) Procedural Process Charts

Small Scale Techniques. These apply principally to single-worker jobs or to limited numbers of persons working together; they also assume more repetitive types of work than are common in hospitals. Thus, the following are considered secondary to the techniques above:

(13) Multiple-Activity Analysis
(14) Multi-Man Analysis

One semi-notes in the first list relates actually to all. Number (8), Final Flow Process Chart/Flow Diagram Strategy, covers the how-to-do-it personal-relations aspects of performing Work-Simplification projects. This is important because Work Analysts must not only perform their work without creating worker opposition but frequently must "sell" their improvement ideas to often conservative supervisors and officials.

Two semi-notes, numbers (7) and (10) are carefully compiled check-lists. If used systematically, these stimulate the flow of ideas and supplement the user's ability to conceive improved methods. These, in short, stimulate and substitute for native creativity. As noted earlier, other semi-notes were in preparation to replace the two Small-Scale ones. However, the last minute loss of Bennett's book as auxiliary textbook and lack of time prevented this.

Specifically, semi-notes on Systematic Room and Building Layout, Time Study and Work Sampling, would have been added, as suggested

by the Questionaire results, had time permitted. In lieu of semi-notes coverage, Systematic Room and Building Layout material is incorporated into three separate Case Problems, numbers 2, 3, and 10.

The present semi-notes alone form a book of 117 single-spaced pages. All were rewritten and amplified to eliminate the original dependence upon Bennett. All are original work, unduplicated elsewhere.

3. The Case Problems

The third part of the completed package course is a set of 11 multi-lithed homework problems for students to perform.

Aside from the first one, these are case-type in format and thoroughly describe typical hospital problems and practices and their ramifications, etc., before presenting a related question for the students' solution. All drawings, forms, blank charts, etc., needed for solutions are provided, plus extras for possible spoilage. In general, each problem demonstrates the use of one of the techniques taught in the semi-notes, and requires the students to employ it. Thus, at the conclusion of the course, each student will have demonstrated his proficiency with these standard Work Simplification methods and will have a corrected example to keep in his files.

Meanwhile, the case settings of the problems detail great amounts of intimate hospital operating methodology, both efficient and inefficient. The students thus find themselves solving real problems, the counterparts of which handicap most U. S. hospitals. Most parts of the average general hospital are thusly examined in some detail. The Case Problems follow the rough order of the semi-notes and Orientation Book.

The introductory problem helps orient students to the present United States hospital and health-case crisis, in which more and more people yearly want and need medical care, but the costs are rising so steeply (doctors 10%-12%/year, hospitals 15-17%/year), that fewer and fewer and fewer people can afford it. The students are asked to write a brief paper comparing the author's views expressed in Chapter 1 of the Orientation Book with those of the Editors of Fortune detailed in their

book Our Ailing Medical System: It's Time to Operate, Perennial Library, Harper and Row, 1970, 95¢. Between the former calm historical view and the latter journalistic-expose treatment, the students gain an overall picture of the difficult world in which United States hospitals now operate, together with a glimpse of their divided management structures.

The first and second technique-type problems are related to the architectural design of hospitals, especially as this affects the Nursing work-load and its 50% of most hospitals' payrolls. These problems are keyed to the first two semi-notes, and suggest how the newest hospital designs promise to save 50% of nurses' walking compared to conventional buildings.

The third and fourth homework problems study the operation respectively of Dietary Kitchens (and food delivery to patients) and Emergency Rooms. These relate to semi-notes (5), (5a), (6), (7), and (8) as well as to Orientation Book chapters.

The fifth problem concerns the improvement of small white-collar departments exemplified by The Mail Room, and demonstrates the use of Work Distribution Analysis as detailed in semi-notes (9), (10), and (11). In so doing, it reveals significant intra-departmental worker-manager relations and employee psychology problems.

The sixth and seventh Case Problems apply Procedural Process Analysis from semi-notes (12) to the Central Supply and Pharmacy Departments, particularly their paperwork relations with Nursing Units, Emergency Room, and Business Office. These demonstrate both the flow of supplies between departments and the accompanying financial charges and Accountability" provisions.

The eighth homework problem applies the Small Scale technique of Multiple Activity Analysis, as detailed in semi-notes (13), to workers operating semi-automatic machines, as occurs in many departments including Central Supply, Laboratory, Dietary, Business Office, and the Laundry. The actual case concerns a Dietary Department dishwashing machine and its operator.

The ninth problem is related to the eighth one. It applies

the Multi-Man Analysis of Semi-notes (14) to two cases of poorly coordinated human teamwork. One concerns two Dietary workers distributing patients' food trays from a standard food-cart. The second concerns the Dietary workers who originally load patients' food trays at simplified assembly-line conveyors called Tray Lines.

The final Case Problem concerns the re-layout of a Snack Kitchen or Floor Pantry attached to a Nursing Unit. The solution involves both the Flow Diagram techniques of the early semi-notes and the use of templates. The rearrangement of this key nursing facility should save not only Nurse walking time but also conflicts which occur as two or more attempt to work in ill-planned and congested space.

To conclude, the Case Problems are used as teaching devices as well as demonstrations of work simplifying techniques. Students who complete them should be ready to attempt real problems in real hospitals.

The problems are original with the author, except that one is adapted from a drawing obtained from another college.

V. Project Evaluation

This project had two phases: the development of the package teaching curriculum, and its evaluation.

The ultimate evaluation of the system can occur only when it is used by the very teachers for whom it was written: non-engineers teaching Work Simplification techniques to inter-disciplinary classes of health-career students.

However, most components of the project underwent repeated evaluations in the author's classes. Indeed, the 14 semi-notes included here are the survivors of 18 originally completed.

1. Evaluation of the Orientation Book.

Since the start, copies of the Orientation book have been given to a number of knowledgeable acquaintances in the field and their criticisms and suggestions requested.

Unfortunately, the following excerpts from their letters do not refer to the same version of the book. However, the following comments, with extraneous materials edited away, suggest its probable utility in the health field:

GEORGIA INSTITUTE OF TECHNOLOGY
School of Industrial Engineering
Atlanta, Georgia 30332

PROGRAM IN HOSPITAL AND MEDICAL SYSTEMS

June 20, 1968

MEDICAL COLLEGE OF GEORGIA
Augusta, Georgia 30902

Please excuse my lateness in responding to your request concerning the review of your manuscript, but I have circulated it to all of our members here in Augusta and it has taken a little while for all of them to read the manual.

In general, the reaction of the group as a whole was highly favorable. We feel your effort is an excellent one in briefing a novice Industrial Engineer in the operation and organization of the voluntary hospital. Perhaps a few of the job descriptions are not typical of most hospitals (see the Dictionary of Occupational Titles for Hospitals). Your manuscript, however, would prove invaluable as a first step in preparing an operations manual for a specific hospital.

We believe that you have neatly presented the similarities that may be expected from one general hospital to the next. A little more attention to generalizing the functions of several of the hospital departments (e.g. business office) may be in order for your next revision. Again, the purpose of your manual may be to indoctrinate students in the workings of your hospital there and not all hospitals in general.

If you have any additional copies that we may have, I would like to give each of our members one so that he may spend more time in reviewing its content. There are approximately ten (10) of us here in Augusta now. I sincerely hope that my comments will encourage you to pursue further endeavors of this nature, for this type of manuscript is needed in many hospitals.

Sincerely,

William G. Sullivan
Systems Engineer

HOSPITAL EDUCATIONAL AND RESEARCH FUND
INCORPORATED
111 WASHINGTON AVENUE • ALBANY, NEW YORK 12210
dedicated to efficiency and economy in patient care

August 8, 1968

Many thanks for the opportunity to review your manual, "Introduction To A Typical U.S General Hospital." Without a doubt, you have undertaken a job of horrendous proportion -- though the field (interested novices) could benefit from such a contribution.

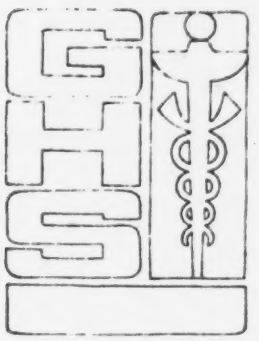
Both Miss Sandra Sherlock, of Community Systems Foundation, and myself reviewed your work. We did not always agree with each other on all specifics; but, in general, we both felt that despite the wonderful insights you documented, the manual could perhaps be improved if you collaborated with an experienced hospital administrator. In fact, we would encourage you to do so as you have obviously dedicated much time and effort to this project.

When you complete your effort, we would be most interested in receiving final copies. A goal of our program , and C.S.F.'s, is to bring students and experienced engineers ("retreads") into the hospital field. Your manual would be of tremendous value to their orientation. Our comments regarding your efforts were made with this goal in mind.

Sincerely,

HOSPITAL EDUCATIONAL & RESEARCH FUND

Patric E. Ludwig, Director
Management Engineering



Greenville Hospital System
100 Mallard Street
Greenville, South Carolina 29601

June 3, 1969

I appreciated the opportunity to read your introduction to a typical U.S. General Hospital and feel that it is very well done. I lent it to a summer employee of mine who is working on his doctorate in industrial management at Clemson University, and he said that it was a great help to him in getting acquainted in a hurry with a hospital's inner workings.

Sincerely,

W. C. Buck
Director of
Industrial Engineering

COMMUNITY SYSTEMS FOUNDATION

ANN ARBOR • BALTIMORE • NEW HAVEN

REGIONAL OFFICE
2200 Fuller Road
Ann Arbor, Michigan 48105
313 - 761-1357

May 22, 1970

While reviewing some old files with Miss Sandra Sherlock, I found reference to a manual, "Introduction to a Typical U. S. General Hospital", which you wrote and of which an initial draft was reviewed by Miss Sherlock and Pat Ludwig.

Was this manual ever published? I would appreciate any reference you might be able to provide. From the discussion in the letter which Pat sent you on August 8, 1968, it sounds like just what we are looking for to orient new staff members.

Sincerely yours,

R. John Smith
Managing Director

Virginia Commonwealth University

October 20, 1970

Bill Delamar, the director of the Hospital and Health Services Division of the American Institute of Industrial Engineers, recently showed me a copy of your publication, "An Introduction to a Typical U.S. General Hospital," revised in the fall of 1970. Your publication in my

estimation seems to present data on a hospital that is very relevant to today's situation. Also, in my estimation your publication is heads and shoulders above MacEachern's book.

I would like to ask your permission to submit a review of your book for publication in the IE journal. In order that I might accomplish this, I would need a copy of your publication for review.

Sincerely yours,

Robert O. Harvey, Chairman
Publications,
Hospital and Health Services Division - AIIE

MEDICAL COLLEGE OF GEORGIA

Division of Health Systems Engineering

23 October 1970

AUGUSTA, GEORGIA 30902

We are interested in obtaining a copy of your book, Introduction to a Typical U. S. General Hospital, Revised Fall 1970. Please let me know the cost for having a copy of the book sent to us.

Sincerely,

J. B. Mathews, Ph.D.
Assistant Director

Virginia Commonwealth University

October 26, 1970

I recently have had an opportunity to review the 1970 edition of your book entitled "Introduction To A Typical United States General Hospital." I find this to be a good general treatment of the subject, and would like to have a copy for my library. Would you please forward me a copy of this document, enclosing an invoice if a charge is appropriate.

Sincerely,

Lawrence D. Prybil, Ph. D.
Assistant Professor
School of Hospital Administration

LDP/ah

COMMUNITY SYSTEMS FOUNDATION
ANN ARBOR • BALTIMORE • NEW HAVEN

ANN ARBOR OFFICE
2200 Fuller Road
Ann Arbor, Michigan 48105
313 761-1313

February 18, 1971

Mr. John R. Watt, Director
Hospitals Systems and Research Program
University of Texas at Austin
College of Engineering
Austin, Texas 78712

Dear Mr. Watt:

Please forgive my late response to your letter. I have been quite busy and wanted to review your manuscript in detail before commenting.

As a basic introductory document, "Introduction to a Typical U. S. General Hospital" appears to be quite well conceived and presented. I would personally like to see each area covered in somewhat more detail. We are currently in the process of developing a manual which will introduce hospitals and health care related systems to management engineers with no previous hospital experience. This manual will describe each hospital department in terms of general functions, information systems, terminology and skills of the staff, as well as indicate some of the management engineering techniques typically applied to problems in each department. I would be happy to send you some of these materials as they are developed.

Thank you very much for sending me your material, and I look forward to corresponding with you in the future.

Sincerely yours,

R. John Smith
Assistant Director

RJS/rv

BOARD OF TRUSTEES
Patric E. Ludwig, Chairman
Herbert A. Anderson
Karl G. Bartscht
Barton R. Burkhalter, Ph. D.
William W. Cooper
Richard J. Davidson
Merrill M. Flood, Ph. D.
Robert E. Fryer, J.D.
William D. Drake, Ph. D.
Sister Mary Leonette, R.S.M.
Theodore M. Newcomb, Ph. D.
Kenneth J. Shouldice, Ph. D.
Mathew W. Steiner
Gabriel Velazquez, M.D.

MEMBERSHIP
Karl G. Bartscht
Barton R. Burkhalter, Ph. D.
Merrill M. Flood, Ph. D.
Frederick L. Goodman, Ph. D.
Dean H. Wilson

In its present format, the Orientation Book has not been submitted to publishers. However, an earlier version was sent to two, and received the following comments. It seems clear that highly specialized publishers will prove the most interested.

Prentice-Hall, Inc.
Englewood Cliffs, N.J. 07632

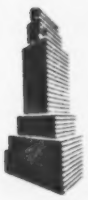
Tel: 201-947-1000
Telex No. 13-5423

April 7, 1969

Thank you for your letter of March 21st and for your courtesy in sending me your evolving text on "Hospital Orientation". While I agree with you as regards the potential "professional" market for a published work in this area, I do not feel, very candidly, that there is a sufficient text or course market for us to consider publication here in the College Division of Prentice-Hall.

It might well be that the American Hospital Association would be interested in pursuing publication of your work and I suggest you contact them. Nonetheless, I would like to thank you for the opportunity of looking at your material and would like to hold on to the preliminary copy for reference if this is amenable to you.

Albert A. Belskie
Science Editor



McGRAW-HILL BOOK COMPANY
330 WEST 42ND STREET NEW YORK N.Y. 10036
A DIVISION OF McGRAW-HILL INC

October 15, 1970

Mr. Keith Davies informs me that you are developing a manuscript entitled INTRODUCTION TO A U.S. GENERAL HOSPITAL which grew out of a course given at your school. While this indeed sounds like a very interesting project, the market for such a text is very small. Our market estimates indicate that the sale we might expect would simply not be large enough to make publication economically feasible.

I am sorry not to have a more encouraging report for you. Thank you for considering McGraw-Hill.

Very truly yours,

B. J. Clark
Engineering Editor

2. Evaluation of the Semi-Notes.

As noted earlier, almost all of the semi-notes have been used in four of the author's past interdisciplinary classes, and at least half in five. A few were also used in a parallel Industrial Engineering Course. At the moment of writing, 10 of the 14 have been used also in the present Spring 1971 Hospital Methods Improvement class. Thus, the semi-notes have been well tested.

The author, a college-teacher since 1941 and a usually successful lecturer, finds the semi-notes the best teaching mechanism of his career.

They communicate more data, more exactly, and more quickly than any method he has used previously. However, he admits that using them gives the instructor little of the exhilaration of ordinary lecturing. To the teacher, their classroom use may even seem dull.

Statistical Evaluation. Of course, true evaluation must reflect the students' opinions. Virtually every semester the author has concluded each course with the standard Teaching Effectiveness questionaires used in his College of Engineering. Administered by student officials, these are anonymous and out of the teachers' control.

Each semester, on carefully chosen teaching criteria, the students have thus rated the author on a 5-step scale ranging from "Excellent" to "Unsatisfactory". Fed into a computer, the questionaires have compared him on each criterion with all other College of Engineering teachers rated that semester. Then the computer has printed-out his percentile ranking among his fellows for each testing category, by computing what percent of the Engineering faculty fell below him on that criteria.

This system has inspired the author and his colleagues to perfect their teaching methods, and the Engineering faculty now wins many prizes for teaching excellence. The competition is keen and teaching standards are continually rising. Accordingly, this computerized questionaire system provides the best available means for evaluating the semi-notes teaching system developed by this project.

To evaluate the semi-notes system accurately, a "control"

class is needed. The semi-notes' results must be compared with those from a very similar class taught by other means. No other comparison seems as valid.

Fortunately, each Fall the author teaches an elementary Industrial Engineering course almost identical in content to the interdisciplinary Hospital Methods Improvement class. Most of the technology is identical, although one class orients the students to factories and the other to hospitals. Because of this similarity, in the Fall of 1968 the author used the same semi-notes in both classes, with little adjustment.

However, in the Falls of 1969 and 1970, the author taught his ME 373K, Basic Industrial Engineering class by standard lecture methods. Simultaneously he taught his ME 379M.1, Hospital Systems Analysis and Improvement class by the semi-notes system. Both had predominantly Junior and Senior students.

The comparisons were overwhelmingly in favor of the semi-notes:

Rating Criteria* Fall 1969

	ME 379M	ME 373K	DIFFERENCE
Course content inherently interesting	66%**	9%**	57%
Course relevance to curriculum of study	49	29	20
Course is well balanced	70	22	48
Text is valuable learning aid	80	12	68
Homework supports learning experience	94	38	56
Makes educational objectives clear	87	29	58
Subject matter well organized	76	63	13
Emphasizes important material	78	24	54
Inspires interest in course material	84	31	53
Interprets abstract ideas clearly	78	30	48
Relates course to engineering applications	90	60	30
Class confident of instructor's knowledge	76	36	40
Motivates me to do my best work	90	18	72
Enhanced my skills in thinking	96	17	69
Has broadened my interests	97	34	63
Relates well with students	81	48	33

* Three categories concerning labs, etc. omitted as not pertinent.

**Percentages indicate the fraction of College of Engineering instructors falling below the author in each questionnaire category that semester.

Effectively answers student questions	77	54	23
Availability outside of class	95	47	48
Expectation on Tests, assignments clear	26	2	24
Returns homework and tests promptly	38	2	36
Has evidence to evaluate achievement	92	3	89
Grades and treats students fairly	65	8	57
Speaks clearly. Is easily understood	56	47	9
Makes effective use of visual aids	65	47	18
Maintains control of class	66	20	46
AVERAGES	75%	30%	45%

Rating Criteria* - 1970

	ME 379M	ME 373K	DIFF-ERENCE
Homework supports learning experience	71%	71%	---%
Course objectives clear	72	40	32
Instructor explanations clear	79	65	14
Identifies important materials	65	39	26
Subject matter well organized	68	82	-14
Relates course to engineering applications	66	74	-12
Confident of instructor's knowledge	30	42	-12
Assignments and expectations clear	2	9	-7
Homework returned promptly	22	30	-8
Encourages class discussion	77	27	50
Motivates student to do best work	47	40	17
Evidence to evaluate achievements	68	24	44
Instructor invites criticism	88	35	53
Awareness of class understanding	72	43	29
Informed of class progress	63	31	32
Interested in students	69	41	28
Availability for outside conferences	54	42	12
Effectively answers questions	58	35	23
Fair and impartial	32	20	12
Dynamic and energetic	55	34	21
Enjoys teaching	88	49	39
Instructor self-confident	56	39	17
Student thinking-skills enhanced	65	27	38
Appreciation for subject increased	67	42	25
Instructor's overall teaching methods	67	46	21
Instructor's overall presentation	72	51	21
Instructor's overall responsiveness	63	48	15
Instructor's overall teaching enjoyment	57	46	11
	62%	42%	20%

*Two categories are omitted as not pertinent

In the Fall of 1969, 25 pertinent categories were ranked by the students. All 25 criteria were ranked higher by the 11 semi-notes students than by the 31 members of the other class. The average was 45% higher.

Four categories which were in the author's ten lowest rankings in ME 373K rose into his ten best categories in ME 379M, the semi-notes course. These were:

Has Evidence to Evaluate (Students') Achievements
(3rd worst in ME 373K; 4th best in ME 379M)

Text is Valuable Teaching Aid
(6th worst in ME 373K; 10th best in ME 379M)

(Teacher) Enhances Students' Skills in Thinking
(7th worst in ME 373K; 2nd best in ME 379M)

(Teacher) Motivates Students to do Best Work
(8th worst in ME 373K; 6th best in ME 379M)

In the Fall of 1970, 29 applicable criteria were rated by the two classes. The 21 semi-notes students rated their teaching higher on 23 categories (one was even) than did the control class of 32 students. The average difference was 20%, less than the previous year but still significant.

Two categories ranked in the lowest ten by the ME 373K class were then rated in the top ten by the semi-notes students. These were:

Instructor Invites Criticism
(5th worst in ME 373K; 2nd best in ME 379M)

(Instructor) Encourages Class Discussion
(9th worst in ME 373K; 5th best in ME 379M)

Comparison With Other Faculty. As noted earlier, the Teaching Effectiveness questionaires rate each Engineering teacher against his colleagues for each criterion cited. This allows a second appraisal of the semi-notes system.

In the fall of 1969, the author's two classes rated his performance in the table above. The percentages indicate what percent of the Engineering faculty were ranked lower by their corresponding classes. An average performance would be indicated by a 49% rating.

It will be seen that his semi notes class ranked the author above 75% of his colleagues, while his conventional lecture class rated him over only 30% of them. This suggests (perhaps) that the semi-notes course was 2½ times as well taught as the control class, or at least the students thought so.

The following fall, the author's semi-notes class ranked him above 62% of his fellow faculty members, while his control class rated him only above 42% of them. This suggests that the teaching was perhaps 1½ times as good as in the latter class.

Qualifications. The above evaluation data contains intangible questions. The sizes and compositions of the two classes differed; many questionaire categories concerned instructors more than methods; the questionaires rate the whole course, not just the semi-notes; and the author may have favored one class over another; etc.

Such factors make direct comparisons somewhat questionable. However, the evidence suggests that the semi-notes system clearly helps teachers do a better job; in these two cases it converted a below-average performer into a superior one.

Informal Student Appraisals. Each semester the author asks students for comments on the semi-notes system. Typical class opinions are summarized as follows:

Fall 1969

Advantages
1) A good record of material
2) A good study means

Disadvantages
1) Too detailed
2) Too repetitive

Spring 1970

Advantages
1) Good as future reference
2) Saves work for student and professor

Disadvantages
1) Too bulky
2) Too detailed and repetitive
3) Boring: decreases student attention

Fall 1970

Advantages

1) Aids in studying
2) Good coverage of material
3) Saves time
4) Helps students keep up
5) Eliminates re-copying of notes
6) Stimulates discussion

Disadvantages

1) Boring
2) Does not promote class attendance
3) Slows progress of class
4) Contain too much material

Some of the above indictments have validity. Thus, the author has repeatedly rewritten the semi-notes to eliminate trite elements and repetition.

Similarly, class periods conducted with semi-notes can be duller than with normal lectures: the students are less engrossed in note-taking and can more easily drift mentally afield. This risk is perhaps acceptable in view of the far faster communication of data.

The charge of "slowing class progress" is apparently inspired by boredom, for the fast pace is beyond question.

3. Evaluation of the Case Problems.

All but one of the present problems have been used two or more times in class, but in a different format. When the Bennett book went out of print in December, 1970, the author rewrote the problems to make them totally independent of it.

These changes clearly prevent easy evaluation. However, in their present improved condition, they contribute more to the course than ever before. When the students rate this course in May, 1971, the rankings will necessarily reflect the problems more than formerly.

The students' 1969 and 1970 ratings of the author's course necessarily reflect the quality of the then Case Problems. The favorable rankings given suggest student satisfaction with the latter.

VI. CONCLUSIONS AND RECOMMENDATIONS

This project has developed and tested what it intended: a package course for teaching hospital methods improvement principles to interdisciplinary classes of health-field college students.

Teaching such elementary Industrial Engineering techniques to persons entering hospital and health institution careers is of growing importance today. Through these labor-saving and working-simplifying methods we can attack the present grave shortage of nurses, physicians, and skilled technicians which plagues our whole health-care system. With them we can even attack today's mushrooming costs of hospital care.

These principles arose mostly in our manufacturing industries and indeed are largely responsible for our U.S. standard of living. By using about one industrial engineer for each 100-150 other employees, major industry has pared labor costs and maximized efficiency in thousands of processes which create our abundance of cheap consumers' goods.

By accident of History, almost noone outside of Industrial Engineering knows and uses these methods-improvement principals, even though applying them requires little or no science, mathematics, or formal engineering. More closely akin to Management then to any science, they have been called "the systematic application of Common Sense". Accordingly, most of these work-eliminating principles can be either applied or taught by non-engineers.

These techniques are very applicable to hospital problems, and about 200 U.S. hospitals now employ graduate industrial engineers. These save their employers at least 3-5 times their salaries year after year, while improving patient care, worker morale, and general efficiency perhaps the equivalent of 10 times more.

There are far too few industrial engineers to serve almost 7,000 other hospitals, to say nothing of the 23,000 nursing homes and the 315,000 physicians. Industry releases few such engineers; further, the hospital field frightens many by its complexity. Probably less than 10 "Hospital Industrial Engineers" are graduated yearly by our multitude of colleges.

Accordingly, the need is to teach the key work-simplifying and labor-saving ideas directly to young health-field professionals, who can apply them as well, or perhaps better than engineers. Even if they do not apply this knowledge, studying it should improve all students' management potential.

Unfortunately, this new field lacks both qualified textbooks and instructors. The single book now in print is directed to engineers, not health personnel, and only engineering colleges and some management departments teach the general subject.

For this reason, this project has developed a self-contained Junior-Senior-Graduate Student course which almost any teacher can teach successfully, regardless of his or his students' background .

Its Orientation Book explains and dispels hospital complexity; its semi-notes classroom work-sheets supply both a how-to-do-it textbook and the teachers' lecture material; and its 11 Case Problems both demonstrate and give practice in applying the principles. Students complete the course with perfect sets of very accurate lecture notes, plus the completed problems, for future reference.

This system has been adequately tested in at least four interdisciplinary classes of predominately health-career students. Standard teacher-evaluation questionaires show that it twice improved the author's teaching performance by wide margins over his handling of similar classes by conventional lecture methods. When he uses this system, the students judge him a superior teacher; when he doesn't, he falls below his College of Engineering average.

Recommendations:

First, the opportunity seems clear. Hundreds of health-career students should be offered such an elective course late in their professional curriculums.

While few may become full-time "Work Analysts" similar to hospital-employed industrial engineers, many may use the work-simplification knowledge profitably. They may apply it to their own work, then to their working-partners' jobs, and finally to their departments. Some may eventually trouble-shoot throughout the hospital.

The few who become full-time Work Analysts can contribute the most. Experience shows that these save 3-5 times their salaries yearly while making more than equivalent intangible improvements.

The greatest net savings seemingly occur when such Work Analysts team with outside consulting industrial engineers. The greatest potential savings probably will occur when Nurse Work-Analysts attack nursing problems; male engineers are clearly handicapped here and in other female dominated areas.

Second, this training should occur before the students enter permanent employment. Experience shows that few hospital employees or department heads use such training if received during temporary leave from regular duties. Thus, teaching it in the professional schools seems mandatory.

Finally, all possible health-related professional schools should be solicited, and trial kits of the package course sent them for examination. Perhaps, all class-materials should be furnished them for a trial semester.

It is suggested that the following types of schools be solicited:

1. Schools of Nursing
   a. Three-year hospital-based diploma type
   b. Four year bachelor's degree type
   c. Two year associate degree type
   d. One year LVN-LPN type
2. Schools of Hospital Administration
3. Schools of Public Health
4. Schools of Medicine
5. Schools of Dietetics
6. Schools of Pharmacy
7. Schools of Physical Therapy
8. Schools of Occupational Therapy
9. Schools of Medical Technology
10. Schools of Operating Room Technology
11. Schools of Radiologic Technology

Second, the following should also be circularized because of their dominant roles in long-term hospitals and custodial institutions:

12. Schools of Psychiatry
13. Schools of Social Work
14. Departments of Psychology
15. Departments of Sociology

Third, these further areas should be solicited as possible users of this specially developed course. These include:

16. Schools of Architecture
17. Schools of Industrial Engineering
18. Schools of Business Administration
19. Schools of City and Area Health Planning
20. The American Hospital Association
21. The American Nurses Association
22. The American Medical Association

Finally, the "extension divisions" of most universities should be queried. Many of these write and print books and teaching materials for junior colleges in their areas. Soliciting these may thus both unlock the junior college nursing school market and also obtain the needed publishing and distribution services.

Conclusion. The package teaching course in Hospital Methods Improvement developed by this project can do much potential good in our critical health-care-delivery field. It deserves a vigorous and sincere trial.

VII. APPENDIX

In the summer of 1970, a questionnaire was sent to 90 members of the Hospital Management Systems Society, a division of the American Hospital Association.

The aim was to evaluate the author's course-plan as used in the Spring of 1970. Accordingly, HMSS members who were identifiable as industrial engineers employed in hospitals were asked to comment on the subject matter offered.

The attached sheet from the original questionnaire displays the opinions of 52 who replied. The left-hand numerical column indicates the author's original proportioning of materials. The tally column beside it shows respondants' suggestions for increasing the coverage of particular subjects. The right-hand tally column shows conversely their suggestions for decreasing particular coverage.

The Summary column at the right displays the compiled results; a "plus" sign indicates desire for more coverage; a "minus" sign, the contrary; and the sizes of the numbers denote the net pluralities involved.

This study suggests what actual hospital industrial engineers in the field believe should be taught persons entering their work.

Many of the respondants' ideas were later utilized by the author; however, lack of time prevented the use of others.

This questionnaire (and other pages not shown) was approved for use by Office of Education officials on June 2, 1970.

QUESTIONAIRE RESULTS SUMMARY SHEET

HOSPITAL SYSTEMS RESEARCH PROGRAM,
The University of Texas at Austin

QUESTIONNAIRE on recommended coverage for introductory college courses in Hospital Methods Improvement for non-engineers.

I. Please comment on our present estimated coverage of the following subjects, by checking in the appropriate columns.

Subject Matter	Present % of Course	Suggest Increase	Believe O.K.	Suggest Decrease	SUMMARY ~~No Opinion~~
The History of Hospitals	2.%	//		////-//// /	-9
The Types of Hospitals	2.	//		////-////	-8
The Present Hospital Crisis	2.	////-////		////-///	+2
Causes of the Hospital Crisis	2.	////-////-////		////-	+10
Obsolete Buildings Problem	2.	///		////-////	-7
Sickroom Labor-Saving Ideas	1.	////-///		/	+7
Hospital Organization and Function	17.	///		////-////-////-////	-20
Introduction to Methods Study	9.	////-//		//	+5
Flow Process Charts and Flow Diagrams	10.	///		////-//	-4
Assembly Process Charts	1.	///		////-//	-5
Strategy in Selling Changes	5.	////-////-////-////			+25
Procedural Process Charts	7.	/		////-////	-14
Work Distribution Charts	8.	//		////-////	-9
Man and Machine Charts	5.			//-////-////-////-////	-32
Multiple Activity Charts	4.	/		////-////-////-///	-23
Right and Left Hand Charts	5.			///-////-////-////-////	-38
Motion Economy Principles	4.	////-		////-//	-1
Fatigue and its Control	1.	////-////		/	+8
Time Study	1.	////-////-////-////		///	+20
Work Sampling	1.	////-////-////-////-////-/		///	+38
Work Place Layout	2.	////-////-////-////		//	+20
Building Layout	2.	////-////-////		//	+12
Forms Design	5.	////- /		////-///	-3
General Hospital News	2.			////-////-////	-17
Computor Usage	1.	////-////-////-////-////		//	+28